

Hoophouses, Worms and Herbs - Closing the MSU Food Cycle Loop

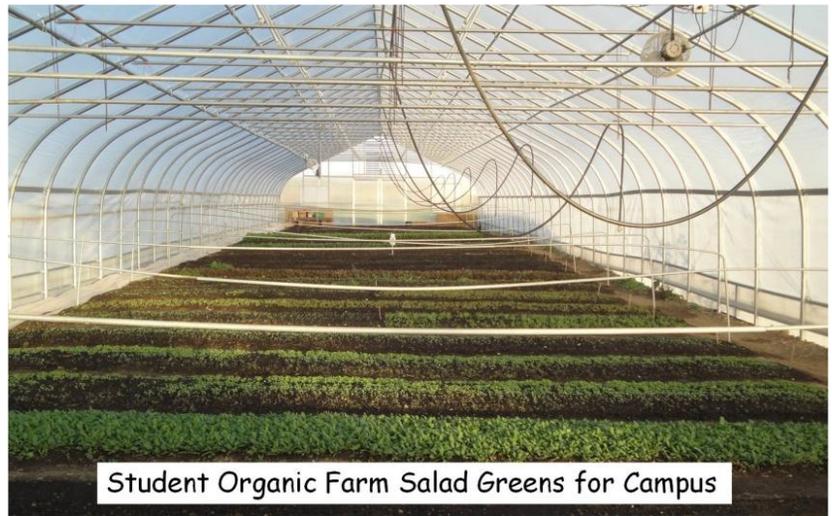
A Partnership of Academics and Operations for Entrepreneurial and Experiential Learning

The organic and local food movements have provided a rich learning environment for MSU students. Over the past decade several programs on campus have worked together to cultivate an integrated curriculum of experiential and entrepreneurial education that brings students together with university academics and campus operations staff.

The Local Food Connection

The MSU Student Organic Farm (SOF) has provided year-round organic vegetables through a community supported agriculture (CSA) program since 2003. Unheated greenhouses called hoophouses allow 5 to 6 week earlier harvest of warm season vegetables and winter harvesting of cool season vegetables. A large walk in refrigerator allows storage of crops produced in the summer for distribution in the winter.

In 2008 the Student Organic Farm (SOF) partnered with the MSU Mott Group for Sustainable Food Systems (now MSU Center for Regional Food Systems), Campus Residential and Hospitality Food Services (RHS) and the Environmental Studies Specialization (RISE) to grow organic salad greens for MSU students. Not only were we shortening the distance between farmer and consumer to 4 miles, we were demonstrating how students could feed each other in a community of care. One of the project objectives was to explore how part of the 20 tons of salad consumed on the MSU campus each year could be locally produced using hoophouses like those used



Student Organic Farm Salad Greens for Campus



to harvest vegetables year-round at the SOF since 2001. RHS and MSU Food Stores have continued to support the SOF production by purchasing a variety of vegetables when available.

In 2009, RHS, RISE and the SOF developed a plan to both increase the capacity for on campus food production and to also meet the needs of freshman that wanted to experience the SOF but lacked transportation to the farm on South Campus. Thanks to advance contracting for production of culinary herbs for our campus chefs, a hoophouse was planned as part of the Bailey Hall renovation so RISE

environmental studies students could begin learning about how the human designed economy can work in harmony with natural cycles through organic growing methods, composting and the food cycle.

Closing the Food Cycle Loop by Worm Composting Food Scraps

In 2010 and 2011 the offices of Campus Sustainability and RHS funded a new project to investigate the feasibility of worm composting campus kitchen food preparation residue in a hoophouse at the SOF. Our goal was to begin to address the emerging awareness that as much as 40% of the food in the US is not consumed by humans and that as much as 95% of the waste is ending up in landfills where it contributes to greenhouse gasses. Another one of our goals was to demonstrate that the same unheated greenhouse technology that allowed us to harvest vegetables all winter would also allow us to use worm composting through the winter to process food residue into valuable compost for growing more vegetables. We also set out to engage MSU students in the task of returning minerals and organic matter to our farms to sustainably maintain our soils for future generations (close the loop). A key component of organic farming is building soil organic matter and fertility with local resources like compost and nitrogen fixing crops grown on the farm. Food scraps are a valuable resource that needs to be recovered and recycled and worm composting is a biological low tech, low cost way to turn “garbage” to “gold”.



After two successful years of growing a worm population and learning the vermicomposting methods, in 2012 worm composting expanded with the support of the Recycling Center moving approximately 100,000 pounds of kitchen preparation residue from campus to the SOF. The worm composting project is now testing seven methods of worm composting including a new flow through system that approximates large scale commercial systems for much lower starting cost. The seven systems include: 1) angled wedge bed, 2) contained static bed with ground contact, 3) fully contained static bed in a wooden box, 4) stacked crates, 5) bulk bags, 6) vermiwash, and 7) non-mechanized flow through. We have now completed three years of successful winter worm composting and are also moving worms outside to windrows with minimal protection. The resident worm population is estimated at over 500,000 or about 500 lbs of worms and growing. The food scrap delivery has been upgraded to include a covered cement work surface and adequate drainage to allow better year round access including periods of heavy rain. Some of the vermicompost is being used to grow vegetable transplants for the SOF and herbs in containers. The Recycling and Surplus Center is also selling worm compost to the MSU and local community with over \$1000 of sales in the first year.

MSU Recycling Center transports kitchen preparation scraps to the SOF for composting.



THE Liberty Hyde Bailey GREENhouse and Urban Farm

The Liberty Hyde Bailey GREENhouse was constructed during June and July 2012 as part of the Bailey Hall renovation. The ~ 45 cubic yards of “soil” in the GREENhouse was produced starting in the fall of 2011 by composting an estimated 60,000 pounds of post consumer food residue from Brody Square with animal manure and bedding from south campus and soil. The compost made from food residue helps demonstrate how a local food and mineral cycle can help cultivate environmental responsibility, healthy citizens, and farms for the future.



Planting, growing and harvesting culinary herbs started in August 2012 and continued through the fall semester. The returning RISE students living in Bailey Hall were greeted with a variety of new opportunities for learning including the concept of the food cycle loop. In the first 4 months of the project (fall 2012) over \$3000 of fresh herbs were purchased by Brody Square and the Kellogg Center. Sales for 2013 were at \$7400. The funds will be used for the long term sustainability of the project and student participation.

Some of the herbs being produced are basil, cilantro, parsley, sage, rosemary, thyme, oregano, chives, tarragon, dill, peppermint and spearmint. Because the GREENhouse is a passive solar greenhouse (hoophouse) and not heated except by the sun, not all of the herbs are productive year-round. Basil is produced during warmer periods while parsley can be grown all year. Sage, rosemary, thyme and oregano are woody plants that will grow in the summer and can also be harvested in the winter. Tarragon, peppermint and spearmint will stop growing for the winter and will die back to the ground. As space allows we also grow lettuce, leafy vegetables and microgreens.



The project continued to grow in 2013. Students submitted project proposals that were funded for worm composting in the Bailey GREENhouse and container gardening on a section of the roof of Bailey Hall. A covered outdoor three section compost system was designed and constructed by RISE students and is now in use. A rain water collection garden was constructed along with ten raised beds in July. The beds were filled with a variety of food based composts made at the SOF.

Food Scrap Composting Site Development

With support from the Office of Sustainability and the MSU Recycling Center, during the summer of 2013 a concrete composting pad was constructed at the farm composting site to take the project to the next level. The pad was covered with a hoophouse frame donated by Niftyhoops (www.niftyhoops.com), a new Michigan company. The road and delivery area were upgraded with gravel and drainage lines to allow deliveries through the winter. Hot composting of kitchen food scraps and municipal leaves from East Lansing continued through the winter with internal pile temperature maintained at 60 to 70°F, even with the cold temperatures. After 2 to 3 weeks of precomposting a portion (10 to 15%) of the compost was taken to the hoophouse to feed the worms. All of the hot and vermicompost will eventually either be used at one of the farms or sold at the Recycling Center.



Developments at Bailey GREENhouse and Urban Farm



A rainwater garden planted at Bailey to demonstrate a means of dealing with excessive stormwater runoff.

Production on campus also continued to grow during the spring of 2014. A transplant germination and production area was developed in the building. The area allowed production of microgreens. A potting bench was constructed for the hoophouse. Raised bed wood frames were constructed to allow for more production on the greenroof. A total of 18 4'x4' beds added an additional 288 square feet of growing area. Landscape Services lifted bags of compost for filling the beds. A crop of romaine lettuce was grown soon after the boxes were filled. The rain garden is working beautifully to capture runoff and attract pollinators.



Compost being lifted onto the green roof at Bailey Hall



A three bin composting system at Bailey GREENhouse

Entrepreneurial Project Development

During the 2013-2014 academic year RISE students worked on testing and developing ideas related to production of fragrant herbal sachets or small pillows that can be used to improve the quality of sleep and dreaming. Potential point of sale is to fellow students needing sleep and the nearby Kellogg Conference Center with over 20,000 overnight visitors per year.

Dried herbs including peppermint, spearmint, lemon verbena, lemon grass, passion flower and lavender are being blended for herbal teas that can also be marketed to fellow students and by the Kellogg Center State Room. The first tea bags were tested at the end of spring semester 2014 and larger scale production is scheduled for the fall as well as either construction or purchase of herb drying equipment that can be used for the project.

Rise students also gathered monthly for Friday afternoon cooking classes in the dormitory kitchen that overlooks the urban farm. They make use of herbs and greens from the farm together with purchased supplies to prepare fresh, flavorful, fantastic feasts celebrated by friends.



Graduate Student Research

Project funding is also supporting the laboratory and greenhouse research of PhD candidate Brooke Comer. The research includes ten compost feedstock mixtures using local municipal and farm organic matter including leaves, grass clippings, straw, hay, wood shavings and manure. Water extracts or “teas” of the composts are being tested for biological activity and for their use as a plant protectant against certain diseases. The composts are being tested for seed germination and transplant production. Production of the 10 recipes was repeated in June of 2014.

Some of the worms used for composting were moved from the farm to the laboratory for controlled feeding studies with the most common kitchen food scraps being used at the farm – pineapple and melon rinds, carrot and onion peels, and coffee grounds. The final vermicomposts were tested for nutrients and biological diversity.

Project results have been presented at the 2012 and 2013 National Vermicomposting Conference held by North Carolina State University and a presentation is scheduled at the 15th annual conference in July 2014. (www.bae.ncsu.edu/workshops/worm_conference.html) We will also be presenting at the national meeting of the Sustainable Agriculture Educators Association, also being held at North Carolina State University in August. Dr. Matt Raven and Dr. Laurie Thorp have presented about the project at professional meetings during the summer.

Looking towards the Future

We are looking forward to the start of the 2014-2015 academic year with several new ways that students can engage with food production and marketing, the local food cycle loop and their local food system. Presentations about the project at national meetings in 2013 placed MSU as a leader in the effort to prepare students as environmental stewards through hands on learning in their neighborhood.

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For more information about programs mentioned or involved please visit:

- Vermicomposting – 23 page document of project details and several other power points and reports: <http://www.hrt.msu.edu/john-biernbaum/pg4>
- Vermicomposting and Bailey GREENhouse Research Report http://www.bespartangreen.msu.edu/documents/2012_biernbaum_foodloop_finalreport.pdf
- Student Organic Farm: www.msuorganicfarm.org
- SOF Hoophouse Outreach: www.hoophouse.msu.edu
- Environmental Studies and RISE: <http://ns.msu.edu/index.php/students/rise/>
- MSU Office of Campus Sustainability: <http://www.bespartangreen.msu.edu/about.html>
- MSU Residential and Hospitality Services: <http://rhs.msu.edu/>
- Brody Square <http://rhs.msu.edu/socresp/brody-square-takes-great-measures-reduce-waste>
- Brody Neighborhood: <http://rhs.msu.edu/const/page/brody-building-brody-neighborhood>
- MSU Recycling Center <http://recycle.msu.edu/>
- Sustainability Specialization: <http://sustainabilityspecialization.msu.edu/>
- Sustainable Agriculture and Food System Specialization: <http://www.safss.msu.edu/>
- Sustainable and Organic Horticulture: <http://www.hrt.msu.edu/degree-requirements/>
- Organic Farmer Training Program: <http://www.msuorganicfarm.org/organic-farmer-training-program>
- MSU Landscape Services <http://landscapeservices.msu.edu/>
- MSU Center for Regional Food Systems <http://foodsystems.msu.edu/>
- MSU Land Management Office and University Farms <http://www.lmo.msu.edu/>

